PART 1 GENERAL

1.01 SYSTEM DESCRIPTION

A. General Requirements

1. The specified unit shall be of manufacturer's official product line, designed for commercial and/or industrial 24/7/365 use.
2. The specified unit shall be based upon standard components and proven technology using open and published protocols.

B. Sustainability

1. The specified unit shall be manufactured in accordance with ISO 14001.
2. The specified unit shall be compliant with the EU directives 2011/65/EU (RoHS) and 2012/19/EU (WEEE).
3. The specified unit shall be compliant with the EU regulation 1907/2006 (REACH).
4. The specified unit shall be PVC-free in accordance with IEC 61249-2-21.

1.02 CERTIFICATIONS AND STANDARDS

A. General abbreviations and acronyms

1. AGC: Automatic gain control
2. API: Application Programming Interface
3. Aspect ratio: A ratio of width to height in images
4. Bit Rate: The number of bits/time unit sent over a network
5. Bonjour: Enables automatic discovery of computers, devices, and services on IP networks.
6. DHCP: Dynamic Host Configuration Protocol
7. DNS: Domain Name System
8. EIS: Electronic Image Stabilization
9. FPS: Frames per Second
10. FTP: File Transfer Protocol
11. H.264 (Video Compression Format)
12. IEEE 802.1x: Authentication framework for network devices
13. IP: Internet Protocol
14. IR light: Infrared light
15. JPEG: Joint Photographic Experts Group (image format)
16. LAN: Local Area Network
17. LED: Light Emitting Diode
18. Lux: A standard unit of illumination measurement
19. MPEG: Moving Picture Experts Group
20. Multicast: Communication between a single sender and multiple receivers on a network
21. NTP: Network Time Protocol
22. NTSC: National Television System Committee – a color encoding system based on 60Hz
23. ONVIF: Global standard for the interface of IP-based physical security products
24. PAL: Phase Alternating Line – a color encoding system based on 50Hz

25. PoE: Power over Ethernet (IEEE 802.3af/at) standard for providing power over network cable
26. Progressive scan: An image scanning technology which scans the entire picture
27. PTZ: Pan/Tilt/Zoom
28. QoS: Quality of Service
29. SMTP: Simple Mail Transfer Protocol
30. SMPTE: Society of Motion Picture and Television Engineers
31. SNMP: Simple Network Management Protocol
32. SSL: Secure Sockets Layer
33. TCP: Transmission Control Protocol
34. TLS: Transport Layer Security
35. Unicast: Communication between a single sender and single receiver on a network
36. UPnP: Universal Plug and Play
37. UPS: Uninterruptible Power Supply
38. VMS: Video Management System
39. WDR: Wide dynamic range

B. The specified unit shall carry the following EMC approvals:
1. EN55022 Class B, EN55024, EN61000-6-1, EN61000-6-2
2. FCC Part 15 - Subpart B Class A + B
3. VCCI Class B
4. C-tick AS/NZS CISPR22 Class B
5. ICES-003 Class B
6. KCC KN22 Class B, KN24

C. The specified unit shall meet the following product safety standards:
1. IEC/EN/UL 60950-1
2. IEC/EN/UL 60950-22
3. IEC/EN 62471 (risk group 1)

D. The specified unit shall meet relevant parts of the following video standards:
1. SMPTE 296M (HDTV 720p)
2. SMPTE 274M (HDTV 1080p)

E. The specified unit shall meet the following standards
1. MPEG-4:
    a. ISO/IEC 14496-10 Advanced Video Coding (H.264)
2. Networking:
    a. IEEE 802.3af/802.3at (Power over Ethernet)
    b. IEEE 802.1X (Authentication)
    c. IPv4 (RFC 791)
    d. IPv6 (RFC 2460)
    e. QoS – DiffServ (RFC 2475)
3. Network video
    a. Relevant ONVIF profile as defined by the ONVIF Organization.
4. Mechanical Environment:
    a. IEC/EN 60529 IP66,

b. NEMA 250 Type 4X
c. IEC/EN 62262 IK10
d. IEC 60068-2-1
e. IEC 60068-2-2
f. IEC 60068-2-6 (vibration)
g. IEC 60068-2-14
h. IEC 60068-2-27 (shock),
i. IEC 60068-2-30
j. IEC 60068-2-78

5. Railway environment:
   a. EN 50121-4
   b. IEC 62236-4

1.03 QUALITY ASSURANCE

A. The Contractor or security sub-contractor shall be a licensed security Contractor with a minimum of five (5) years' experience installing and servicing systems of similar scope and complexity and evidence that is completed at least three (3) projects of similar design and is currently engaged in the installation and maintenance of systems herein described.

B. All camera installation, configuration, setup, program and related work shall be performed by electronic technicians thoroughly trained by the manufacturer in the installation and service of the equipment provided.

C. The contractor or designated sub-contractor shall submit credentials of completed manufacturer certification, verified by a third party organization, as proof of the knowledge.

D. The Contractor shall provide four (4) current references from clients with systems of similar scope and complexity that became operational in the past three (3) years. At least three (3) of the references shall be utilizing the same system components, in a similar configuration as the proposed system

E. The specified unit shall be manufactured in accordance with ISO9001.

1.04 WARRANTY

A. All security system components and labor furnished by the contractor including wiring, software, hardware and custom parts shall be fully warranted for parts, materials, labor and travel expenses for a minimum of three (3) years from date of the final acceptance of the Video Surveillance System.

B. The manufacturer shall provide warranty and optional extended warranty for the camera for a total period of maximum five years. If enacted as part of the contract, the contractor will repair or replace parts and/or labor per the warranty for the length of this warranty at no cost to the client.

PART 2 PRODUCTS

2.01 GENERAL

A. Cameras shall be IP-based and comply with established network and video standards.

B. Cameras shall be powered by the switch utilizing the network cable. Power injectors (midspans) shall be provided by the contractor when required for proper operation.

C. Cameras shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third party applications.

D. Cameras shall comply with relevant ONVIF profile as defined by the ONVIF Organization.

2.02 VIDEO SURVEILLANCE SCHEDULE

A. Camera types listed below describing various resolutions, form-factor and features shall be supplied by a single camera manufacturer video surveillance system.

B. The camera manufacture and model numbers of cameras are as follows:
1. Exterior fixed dome 1080p network camera: AXIS P3225-LVE OR COMPARABLE
2. Interior fixed dome 1080p network camera: AXIS P3225-LV OR COMPARABLE
3. Exterior 5MP bullet-style network camera: AXIS P1427-LE OR COMPARABLE
4. Exterior 5MP fixed dome network camera: AXIS Q3708-PVE OR COMPARABLE

2.03 VIDEO SURVEILLANCE CAMERAS

A. Exterior fixed dome 1080p network camera

1. The fixed network camera shall meet or exceed the following design specifications:
   a. The camera shall operate on an open source; Linux-based platform, and including a built-in web server.
   b. The camera shall be equipped with an IR-sensitive progressive scan sensor.
   c. The camera shall provide a removable IR-cut filter, providing day/night functionality.
   d. The camera shall be equipped with a varifocal lens with P-iris.
   e. The camera shall provide local video storage utilizing a microSD/microSDHC/microSDXC memory card expansion, supporting memory up to 64 GB.
   f. The camera shall be manufactured with an IP66- and NEMA 4X-rated, IK10 impact-resistant casing providing encapsulated electronics.
   g. The camera shall provide a manual 3-axis (pan/tilt/rotation) positioning to allow adjustment for optimum camera rotation and placement.
   h. The camera shall incorporate remote zoom functionality.
   i. The camera shall incorporate remote focus functionality.
2. The fixed dome network camera shall meet or exceed the following performance specifications:
   a. Illumination
      1. The camera shall meet or exceed the following illumination specifications:
         a. HDTV 1080p 25/30 fps with WDR - Forensic Capture - Color: 0.25 lux, B/W: 0.05 lux
         b. HDTV 1080p 50/60 fps - Color: 0.5 lux, B/W: 0.1 lux
   b. Resolution
      1. The camera shall be designed to provide at least two video streams in HDTV 1080p (1920x1080) at up to 30 frames per second (60Hz mode) or 25 frames per second (50Hz mode) using H.264 or Motion JPEG with WDR enabled.
      2. The camera shall be designed to provide at least two video streams in HDTV 1080p (1920x1080) at up to 60 frames per second (60Hz mode) or 50 frames per second (50Hz mode) using H.264 or Motion JPEG without WDR enabled.

3. The camera shall be designed to provide 2 individually cropped out view areas
4. The camera shall support video resolutions including:
   a. 1920x1200
   b. 1920x1080 (HDTV 1080p)
   c. 1600x1200
   d. 1400x1050
   e. 1280x720 (HDTV 720p)
5. The camera shall provide both landscape format (4:3 and 16:9 aspect ratio) as well as corridor format (3:4 and 9:16 aspect ratio).

c. Encoding

1. The camera shall support the following video encoding algorithms:
   a. Motion JPEG encoding in a selectable range from 1 up to 25/30 frames per second in all resolutions with WDR enabled.
   b. Motion JPEG encoding in a selectable range from 1 up to 50/60 frames per second in all resolutions without WDR enabled.
   c. Baseline Profile H.264 encoding with motion estimation in up to 25/30 frames per second with WDR enabled.
   d. Baseline Profile H.264 encoding with motion estimation in up to 50/60 frames per second without WDR enabled.
   e. Main Profile H.264 encoding with motion estimation and context-adaptive binary arithmetic coding (CABAC) in up to 25/30 frames per second with WDR enabled.
   f. Main Profile H.264 encoding with motion estimation and context-adaptive binary arithmetic coding (CABAC) in up to 50/60 frames per second without WDR enabled.
   g. Support High Profile H.264 encoding with motion estimation up to 25/30 frames per second with WDR enabled.
   h. Support High Profile H.264 encoding with motion estimation up to 50/60 frames per second without WDR enabled.
   i. Support H.264 with automatic scene adaptive bitrate control in up to 50/60 frames per second.
2. The camera shall provide independently configured simultaneous H.264 and Motion JPEG streams.
3. The camera shall support both Maximum Bit Rate (MBR) and Variable Bit Rate (VBR) in H.264.
4. The camera shall provide configurable compression levels.
5. Support standard baseline profile H.264 with motion estimation.
6. Support motion estimation in H.264/MPEG-4 Part 10/AVC.
7. The camera shall for its H.264 implementation support scene adaptive bitrate control with automatic dynamic ROI to reduce bitrate in unprioritized regions in order to lowering bandwidth and storage requirements.

d. Transmission

1. The camera shall allow for video to be transported over:
   a. HTTP (Unicast)
   b. HTTPS (Unicast)
   c. RTP (Unicast & Multicast)
   d. RTP over RTSP (Unicast)
   e. RTP over RTSP over HTTP (Unicast)
2. The camera shall support Quality of Service (QoS) to be able to prioritize traffic.

e. Image
1. The camera shall incorporate Automatic and Manual White Balance.
2. The camera shall incorporate an electronic shutter operating in the range of 1/142850s to 2s.
3. The camera shall incorporate Wide Dynamic Range - Forensic Capture functionality providing up to120dB dynamic range.
4. The camera shall provide backlight compensation functionality.
5. The camera shall support manually defined values for:
   a. Color level
   b. Brightness
   c. Sharpness
   d. Contrast
6. The camera shall incorporate a function for optimization of low light behavior.
7. The camera shall allow for rotation of the image in steps of 90º.
8. The camera shall incorporate local contrast functionality.

f. IR Illumination
1. The camera shall be equipped with built-in IR LEDs with adjustable angle of illumination and intensity.
   a. The IR LEDs shall have a range of up to 25 m (82 ft).
   b. The IR LEDs shall emit light with a wavelength of 850 nm.

g. User Interface
1. Web server
   a. The camera shall contain a built-in web server making video and configuration available to multiple clients in a standard operating system and browser environment using HTTP, without the need for additional software.
   b. Optional components downloaded from the camera for specific tasks, e.g. Active X, shall be signed by an organization providing digital trust services, such as Verisign, Inc.
2. Language Specification
   a. The camera shall provide a function for altering the language of the user interface, and shall include support for at least 10 different languages.
3. IP addresses
   a. The camera shall support both fixed IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
   b. The camera shall allow for automatic detection of the camera based on UPnP and Bonjour when using a PC with an operating system supporting this feature.
   c. The camera shall provide support for both IPv4 and IPv6.

h. PTZ functionality
1. The camera shall provide:
   a. Pan ±180°
   b. Tilt -5 to +75°
   c. Rotation ±95°

i. Event functionality
1. The camera shall be equipped with an integrated event functionality, which can be trigged by:
   a. Live Stream Accessed
   b. Day/Night Mode

c. Camera tampering
d. Heater malfunctioning
e. Manual Trigger/Virtual Inputs
f. PTZ functionality
g. Embedded third party applications
h. Edge storage disruption detection

2. Response to triggers shall include:
a. Send notification, using HTTP, HTTPS, TCP or email
b. Send images, using FTP, HTTP, HTTPS, network share or email
c. Send video clip, using FTP, HTTP, HTTPS, network share or email
d. Send SNMP trap message
e. Activate/Deactivate IR Illumination
f. DAY/Night Vision Mode
g. WDR Mode
h. Recording to local storage and/or network attached storage
i. PTZ control functionality

3. The camera shall provide memory for pre & post alarm recordings.

j. Edge storage

1. The camera shall support continuous and event controlled recording to:
a. Local memory added to the cameras SD-card slot
b. Network attached storage, located on the local network

2. The camera shall be able to detect and notify Edge storage disruptions.

k. Protocol

1. The camera shall incorporate support for at least IPv4/v6, HTTP, HTTPS, SSL/TLS, QoS Layer 3 DiffServ, TCP, ICMP, SNMPv1/v2c/v3 (MIB-II), RTSP, RTP, UDP, IGMP, RTCP, SMTP, FTP, DHCP, UPnP, ARP, DNS, DynDNS, SOCKS, SSH, NTP, CIFS/SMB and Bonjour.
2. The SMTP implementation shall include support for SMTP authentication.

l. Text overlay

1. The camera shall:
a. Provide embedded on-screen text with support for date & time, and a customer-specific text, camera name, of at least 45 ASCII characters.
b. To ensure accuracy, the camera shall accept external time synchronization from an NTP (Network Time Protocol) server.
c. Provide the ability to apply privacy masks to the image.
d. Allow for the overlay of a graphical image, such as a logotype, into the image.

m. Security

1. The camera shall support the use of HTTPS and SSL/TLS, providing the ability to upload signed certificates to encrypt and secure authentication and communication of both administration data and video streams.
2. The camera shall provide centralized certificate management, with both pre-installed CA certificates and the ability to upload additional CA certificates. The certificates shall be signed by an organization providing digital trust services.
3. The camera shall support IEEE 802.1X authentication.
4. The camera shall provide support for restricting access to pre-defined IP addresses only, so-called IP address filtering.

5. The camera shall restrict access to the built-in web server by usernames and passwords at three different levels.

n. API support

1. The camera shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third party applications.
2. The camera shall support relevant ONVIF profiles as defined by the ONVIF Organization.

o. Embedded applications

1. The camera shall provide a platform allowing the upload of third party applications into the camera.

p. Installation and maintenance

1. The camera shall be supplied with Windows-based management software which allows the assignment of IP addresses, upgrade of firmware and backup of the cameras' configuration.
2. The camera shall support the use of SNMP-based management tools according to SNMP v1, 2c & 3 / MIB-II.
3. The camera shall allow updates of the software (firmware) over the network, using FTP or HTTP.
4. The camera shall provide the ability to apply a rectangle of customer-defined number of pixels to the image, which can be used as a pixel counter identifying the size of objects in number of pixels.
5. The camera shall store all customer-specific settings in a non-volatile memory that shall not be lost during power cuts or soft reset.

q. Access log

1. The camera shall provide a log file, containing information about the 250 latest connections and access attempts since the unit's latest restart. The file shall include information about the connecting IP addresses and the time of connecting.
2. Provide a connection list of all currently connected viewers. The file shall include information about connecting IP address, time of connecting and the type of stream accessed.

r. Camera diagnostics

1. The camera shall be equipped with LEDs, capable of providing visible status information. LEDs shall indicate the camera's operational status and provide information about power, communication with receiver, the network status and the camera status.
2. The camera shall be monitored by a Watchdog functionality, which shall automatically re-initiate processes or restart the unit if a malfunction is detected.
3. The camera shall send a notification when the unit has re-booted and all services are initialized.

s. Hardware interfaces

1. Network interface
    a. The camera shall be equipped with one 100BASE-TX Fast Ethernet-port, using a standard male RJ45 connector and shall support auto negotiation of network speed (100 MBit/s and 10 MBit/s) and transfer mode (full and half duplex).

t. Enclosure

1. Be manufactured with an IP66- and NEMA 4X-rated, IK10 impact-resistant casing providing encapsulated electronics.

u. Power

1. Power over Ethernet IEEE 802.3af/802.3at Type 1 Class 3

v. Environmental

1. Operate in a temperature range of -30 °C to +50 °C (-22 °F to 122 °F).
2. Operate in a humidity range of 10–100% RH (condensing).

B. Interior fixed dome 1080p network camera

1. The fixed network camera shall meet or exceed the following design specifications:
   a. The camera shall operate on an open source; Linux-based platform, and including a built-in web server.
   b. The camera shall be equipped with an IR-sensitive progressive scan sensor.
   c. The camera shall provide a removable IR-cut filter, providing day/night functionality.
   d. The camera shall be equipped with a varifocal lens with P-iris.
   e. The camera shall provide local video storage utilizing a microSD/microSDHC/microSDXC memory card expansion, supporting memory up to 64 GB.
   f. The camera shall be manufactured with an IP52-rated, IK08 impact-resistant casing providing encapsulated electronics.
   g. The camera shall provide a manual 3-axis (pan/tilt/rotation) positioning to allow adjustment for optimum camera rotation and placement.
   h. The camera shall incorporate remote zoom functionality.
   i. The camera shall incorporate remote focus functionality.
2. The fixed dome network camera shall meet or exceed the following performance specifications:
   a. Illumination
      1. The camera shall meet or exceed the following illumination specifications:
         a. HDTV 1080p 25/30 fps with WDR - Forensic Capture - Color: 0.25 lux, B/W: 0.05 lux
         b. HDTV 1080p 50/60 fps - Color: 0.5 lux, B/W: 0.1 lux
   b. Resolution
      1. The camera shall be designed to provide at least two video streams in HDTV 1080p (1920x1080) at up to 30 frames per second (60Hz mode) or 25 frames per second (50Hz mode) using H.264 or Motion JPEG with WDR enabled.
      2. The camera shall be designed to provide at least two video streams in HDTV 1080p (1920x1080) at up to 60 frames per second (60Hz mode) or 50 frames per second (50Hz mode) using H.264 or Motion JPEG without WDR enabled.
      3. The camera shall be designed to provide 2 individually cropped out view areas
      4. The camera shall support video resolutions including:
         a. 1920x1200
         b. 1920x1080 (HDTV 1080p)
         c. 1600x1200
         d. 1400x1050
         e. 1280x720 (HDTV 720p)
      5. The camera shall provide both landscape format (4:3 and 16:9 aspect ratio) as well as corridor format (3:4 and 9:16 aspect ratio).
   c. Encoding
      1. The camera shall support the following video encoding algorithms:
         a. Motion JPEG encoding in a selectable range from 1 up to 25/30 frames per second in all resolutions with WDR enabled.
         b. Motion JPEG encoding in a selectable range from 1 up to 50/60 frames per second in all resolutions without WDR enabled.
         c. Baseline Profile H.264 encoding with motion estimation in up to 25/30 frames per second with WDR enabled.

d. Baseline Profile H.264 encoding with motion estimation in up to 50/60 frames per second without WDR enabled.
e. Main Profile H.264 encoding with motion estimation and context-adaptive binary arithmetic coding (CABAC) in up to 25/30 frames per second with WDR enabled.
f. Main Profile H.264 encoding with motion estimation and context-adaptive binary arithmetic coding (CABAC) in up to 50/60 frames per second without WDR enabled.
g. Support High Profile H.264 encoding with motion estimation up to 25/30 frames per second with WDR enabled.
h. Support High Profile H.264 encoding with motion estimation up to 50/60 frames per second without WDR enabled.
i. Support H.264 with automatic scene adaptive bitrate control in up to 50/60 frames per second.

2. The camera shall provide independently configured simultaneous H.264 and Motion JPEG streams.
3. The camera shall support both Maximum Bit Rate (MBR) and Variable Bit Rate (VBR) in H.264.
4. The camera shall provide configurable compression levels.
5. Support standard baseline profile H.264 with motion estimation.
6. Support motion estimation in H.264/MPEG-4 Part 10/AVC.
7. The camera shall for its H.264 implementation support scene adaptive bitrate control with automatic dynamic ROI to reduce bitrate in unprioritized regions in order to lowering bandwidth and storage requirements.

d. Transmission

1. The camera shall allow for video to be transported over:
   a. HTTP (Unicast)
   b. HTTPS (Unicast)
   c. RTP (Unicast & Multicast)
   d. RTP over RTSP (Unicast)
   e. RTP over RTSP over HTTP (Unicast)
2. The camera shall support Quality of Service (QoS) to be able to prioritize traffic.

e. Image

1. The camera shall incorporate Automatic and Manual White Balance.
2. The camera shall incorporate an electronic shutter operating in the range of 1/142850s to 2s.
3. The camera shall incorporate Wide Dynamic Range - Forensic Capture functionality providing up to120dB dynamic range.
4. The camera shall provide backlight compensation functionality.
5. The camera shall support manually defined values for:
   a. Color level
   b. Brightness
   c. Sharpness
   d. Contrast
6. The camera shall incorporate a function for optimization of low light behavior.
7. The camera shall allow for rotation of the image in steps of 90º.
8. The camera shall incorporate local contrast functionality.

f. IR Illumination

1. The camera shall be equipped with built-in IR LEDs with adjustable angle of illumination and intensity.
    a. The IR LEDs shall have a range of up to 25 m (82 ft).
    b. The IR LEDs shall emit light with a wavelength of 850 nm.

g. User Interface
1. Web server
    a. The camera shall contain a built-in web server making video and configuration available to multiple clients in a standard operating system and browser environment using HTTP, without the need for additional software.
    b. Optional components downloaded from the camera for specific tasks, e.g. Active X, shall be signed by an organization providing digital trust services, such as Verisign, Inc.
2. Language Specification
    a. The camera shall provide a function for altering the language of the user interface, and shall include support for at least 10 different languages.
3. IP addresses
    a. The camera shall support both fixed IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
    b. The camera shall allow for automatic detection of the camera based on UPnP and Bonjour when using a PC with an operating system supporting this feature.
    c. The camera shall provide support for both IPv4 and IPv6.

h. PTZ functionality
1. The camera shall provide:
    a. Pan ±180°
    b. Tilt -5 to +75°
    c. Rotation ±95°

i. Event functionality
1. The camera shall be equipped with an integrated event functionality, which can be trigged by:
    a. Live Stream Accessed
    b. Day/Night Mode
    c. Camera tampering
    d. Manual Trigger/Virtual Inputs
    e. PTZ functionality
    f. Embedded third party applications
    g. Edge storage disruption detection
2. Response to triggers shall include:
    a. Send notification, using HTTP, HTTPS, TCP or email
    b. Send images, using FTP, HTTP, HTTPS, network share or email
    c. Send video clip, using FTP, HTTP, HTTPS, network share or email
    d. Send SNMP trap message
    e. Activate/Deactivate IR Illumination
    f. DAY/Night Vision Mode
    g. WDR Mode
    h. Recording to local storage and/or network attached storage
    i. PTZ control functionality

3. The camera shall provide memory for pre & post alarm recordings.

j. Edge storage
   1. The camera shall support continuous and event controlled recording to:
      a. Local memory added to the cameras SD-card slot
      b. Network attached storage, located on the local network
   2. The camera shall be able to detect and notify Edge storage disruptions.

k. Protocol
   1. The camera shall incorporate support for at least IPv4/v6, HTTP, HTTPS, SSL/TLS, QoS Layer 3 DiffServ, TCP, ICMP, SNMPv1/v2c/v3 (MIB-II), RTSP, RTP, UDP, IGMP, RTCP, SMTP, FTP, DHCP, UPnP, ARP, DNS, DynDNS, SOCKS, SSH, NTP, CIFS/SMB and Bonjour.
   2. The SMTP implementation shall include support for SMTP authentication.

l. Text overlay
   1. The camera shall:
      a. Provide embedded on-screen text with support for date & time, and a customer-specific text, camera name, of at least 45 ASCII characters.
      b. To ensure accuracy, the camera shall accept external time synchronization from an NTP (Network Time Protocol) server.
      c. Provide the ability to apply privacy masks to the image.
      d. Allow for the overlay of a graphical image, such as a logotype, into the image.

m. Security
   1. The camera shall support the use of HTTPS and SSL/TLS, providing the ability to upload signed certificates to encrypt and secure authentication and communication of both administration data and video streams.
   2. The camera shall provide centralized certificate management, with both pre-installed CA certificates and the ability to upload additional CA certificates. The certificates shall be signed by an organization providing digital trust services.
   3. The camera shall support IEEE 802.1X authentication.
   4. The camera shall provide support for restricting access to pre-defined IP addresses only, so-called IP address filtering.
   5. The camera shall restrict access to the built-in web server by usernames and passwords at three different levels.

n. API support
   1. The camera shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third party applications.
   2. The camera shall support relevant ONVIF profiles as defined by the ONVIF Organization.

o. Embedded applications
   1. The camera shall provide a platform allowing the upload of third party applications into the camera.

p. Installation and maintenance
   1. The camera shall be supplied with Windows-based management software which allows the assignment of IP addresses, upgrade of firmware and backup of the cameras' configuration.
   2. The camera shall support the use of SNMP-based management tools according to SNMP v1, 2c & 3 / MIB-II.
   3. The camera shall allow updates of the software (firmware) over the network, using FTP or HTTP.

4. The camera shall provide the ability to apply a rectangle of customer-defined number of pixels to the image, which can be used as a pixel counter identifying the size of objects in number of pixels.
5. The camera shall store all customer-specific settings in a non-volatile memory that shall not be lost during power cuts or soft reset.

q. Access log

1. The camera shall provide a log file, containing information about the 250 latest connections and access attempts since the unit's latest restart. The file shall include information about the connecting IP addresses and the time of connecting.
2. Provide a connection list of all currently connected viewers. The file shall include information about connecting IP address, time of connecting and the type of stream accessed.

r. Camera diagnostics

1. The camera shall be equipped with LEDs, capable of providing visible status information. LEDs shall indicate the camera's operational status and provide information about power, communication with receiver, the network status and the camera status.
2. The camera shall be monitored by a Watchdog functionality, which shall automatically re-initiate processes or restart the unit if a malfunction is detected.
3. The camera shall send a notification when the unit has re-booted and all services are initialized.

s. Hardware interfaces

1. Network interface
   a. The camera shall be equipped with one 100BASE-TX Fast Ethernet-port, using a standard male RJ45 connector and shall support auto negotiation of network speed (100 MBit/s and 10 MBit/s) and transfer mode (full and half duplex).

t. Enclosure

1. Be manufactured with an IP52-rated, IK08 impact-resistant casing providing encapsulated electronics.

u. Power

1. Power over Ethernet IEEE 802.3af/802.3at Type 1 Class 3

v. Environmental

1. Operate in a temperature range of 0 °C to +50 °C (+32 °F to 122 °F).
2. Operate in a humidity range of 10–85% RH (non-condensing).

C. Exterior 5MP bullet-style network camera

1. The fixed network camera shall meet or exceed the following design specifications:
   a. The camera shall operate on an open source; Linux-based platform, and including a built-in web server.
   b. The camera shall be equipped with an IR-sensitive progressive scan sensor.
   c. The camera shall provide a removable IR-cut filter, providing day/night functionality.
   d. The camera shall be equipped with remote zoom and remote focus functionality.
   e. The camera shall be equipped with a varifocal IR-corrected Megapixel lens with P-iris.
   f. The camera shall provide local video storage utilizing a microSD/microSDHC/microSDXC UHS-I memory card expansion, supporting memory up to 64 GB.
   g. The camera shall be manufactured with an UV-resistant IP66 and NEMA 250 4X-rated polymer enclosure fitted with an adjustable weather shield.
   h. The camera shall be equipped with IR LEDs with adjustable intensity and angle of illumination. Range up to 15 m (50 ft).

2. The fixed network camera shall meet or exceed the following performance specifications:
   a. Illumination
      1. The camera shall meet or exceed the following illumination specifications:
         a. Provide images down to 0.35 lux in color and 0.07 in B/W.
   b. Resolution
      1. The camera shall be designed to provide streams up to 2592x1944 pixels resolution at up to 12 frames per second using H.264 or Motion JPEG, and provide video streams in HDTV 1080p (1920x1080) at up to 30 frames per second using H.264 or Motion JPEG.
      2. Supported video resolutions shall include:
         a. 2592x1944
         b. 2048x1536
         c. 1920x1080 (HDTV 1080p)
         d. 1600x1200
         e. 1280x1024
         f. 1280x960
         g. 1280x800
         h. 1280x720 (HDTV 720p)
      3. The camera shall be able to provide both landscape format (4:3 and 16:9 aspect ratio) as well as corridor format (3:4 and 9:16 aspect ratio).
   c. Encoding
      1. The camera shall support the following video encoding algorithms:
         a. Motion JPEG encoding in a selectable range from 1 up to 12 frames per second in all resolutions up to 2592x1944 pixels.
         b. Motion JPEG encoding in up to 30 frames per second in HDTV 1080p (1920x1080 resolution).
         c. Baseline Profile H.264 encoding with motion estimation in a selectable range from 1 up to 12 frames per second in all resolutions up to 2592x1944 pixels.
         d. Baseline Profile H.264 encoding with motion estimation in up to 30 frames per second in HDTV 1080p (1920x1080 resolution).
         e. Main Profile H.264 encoding with motion estimation and context-adaptive binary arithmetic coding (CABAC) in a selectable range from 1 up to 12 frames per second in all resolutions up to 2592x1944 pixels.
         f. Main Profile H.264 encoding with motion estimation and context-adaptive binary arithmetic coding (CABAC) in up to 30 frames per second in HDTV 1080p (1920x1080 resolution).
      2. The camera shall provide independently configured simultaneous H.264 and Motion JPEG streams.
      3. The camera shall support both Constant Bit Rate (CBR) and Variable Bit Rate (VBR) in H.264.
      4. The camera shall provide configurable compression levels.
   d. Transmission
      1. The camera shall allow for video to be transported over:
         a. HTTP (Unicast)
         b. HTTPS (Unicast)
         c. RTP (Unicast & Multicast)
         d. RTP over RTSP (Unicast)
         e. RTP over RTSP over HTTP (Unicast)

2. The camera shall support Quality of Service (QoS) to be able to prioritize traffic.

e. Image

1. The camera shall incorporate Automatic and Manual White Balance.
2. The camera shall incorporate automatic and manually defined exposure zones.
3. The camera shall support a configurable shutter in the range:
   a. 1/24000 s to 2 s (5 MP)
   b. 1/30500 s to 2 s (3 MP)
   c. 1/34500 s to 2 s (1080p)
   d. 1/35500 s to 2 s (2 MP)
4. The camera shall incorporate Wide Dynamic Range - Dynamic Contrast.
5. The camera shall incorporate capture mode with the following settings:
   a. 1600x1200 (4:3) 2 MP
   b. 1920x1080 (16:9) HDTV 1080p
   c. 2048x1536 (4:3) 3 MP
   d. 2592x1944 (4:3) 5 MP
6. The camera shall provide backlight compensation.
7. The camera shall support manually defined values for:
   a. Color level
   b. Brightness
   c. Sharpness
   d. Contrast
8. The camera shall incorporate a function for optimization of low light behavior.

f. User Interface

1. Web server
   a. The camera shall contain a built-in web server making video and configuration available to multiple clients in a standard operating system and browser environment using HTTP, without the need for additional software.
   b. Optional components downloaded from the camera for specific tasks, e.g. Active X, shall be signed by an organization providing digital trust services, such as Verisign, Inc.
2. Language Specification
   a. The camera shall provide a function for altering the language of the user interface, and shall include support for at least 10 different languages.
3. IP addresses
   a. The camera shall support both fixed IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
   b. The camera shall allow for automatic detection of the camera based on UPnP and Bonjour when using a PC with an operating system supporting this feature.
   c. The camera shall provide support for both IPv4 and IPv6.

g. PTZ functionality

1. The camera shall:
   a. Provide Digital PTZ functionality.
   b. Provide support for up-loadable PTZ drivers.

h. Event functionality

1. The camera shall be equipped with an integrated event functionality, which can be trigged by:

a. Day/Night Mode
b. Live Stream Accessed
c. Motion Detection
d. Tampering
e. Temperature
f. External input
g. Manual Trigger/Virtual Inputs
h. PTZ functionality
i. Embedded third party applications
j. Edge storage disruption detection

2. Response to triggers shall include:
   a. Send notification, using HTTP, HTTPS, TCP or email
   b. Send images, using FTP, HTTP, HTTPS, network share or email
   c. Send video clip, using FTP, HTTP, HTTPS, network share or email
   d. Activating embedded illumination/IR LED
   e. Activate external output
   f. Send SNMP trap message
   g. Recording to local storage and/or network attached storage
   h. PTZ control functionality
   i. Day/Night Vision Mode
   j. Overlay Text
3. The camera shall provide memory for pre & post alarm recordings.

i. Edge storage
1. The camera shall support continuous and event controlled recording to:
   a. Local memory added to the cameras SD-card slot
   b. Network attached storage, located on the local network
2. The camera shall be able to detect and notify Edge storage disruptions.

j. Protocol
1. The camera shall incorporate support for at least IPv4/v6, HTTP, HTTPS, SSL/TLS, QoS Layer 3 DiffServ, TCP, ICMP, SNMPv1/v2c/v3 (MIB-II), RTSP, RTP, UDP, IGMP, RTCP, SMTP, FTP, DHCP, UPnP, ARP, DNS, DynDNS, SOCKS, SSH, NTP, CIFS/SMB and Bonjour.
2. The SMTP implementation shall include support for SMTP authentication.

k. Text overlay
1. The camera shall:
   a. Provide embedded on-screen text with support for date & time, and a customer-specific text, camera name, of at least 45 ASCII characters.
   b. To ensure accuracy, the camera shall accept external time synchronization from an NTP (Network Time Protocol) server.
   c. Provide the ability to apply privacy masks to the image.
   d. Allow for the overlay of a graphical image, such as a logotype, into the image.

l. Security
1. The camera shall support the use of HTTPS and SSL/TLS, providing the ability to upload signed certificates to encrypt and secure authentication and communication of both administration data and video streams.

2. The camera shall provide centralized certificate management, with both pre-installed CA certificates and the ability to upload additional CA certificates. The certificates shall be signed by an organization providing digital trust services.
3. The camera shall support IEEE 802.1X authentication.
4. The camera shall provide support for restricting access to pre-defined IP addresses only, so-called IP address filtering.
5. The camera shall restrict access to the built-in web server by usernames and passwords at three different levels.

m. API support

1. The camera shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third party applications.
2. The camera shall Relevant ONVIF profile as defined by the ONVIF Organization.

n. Embedded applications

1. The camera shall provide a platform allowing the upload of third party applications into the camera.

o. Installation and maintenance

1. The camera shall be supplied with Windows-based management software which allows the assignment of IP addresses, upgrade of firmware and backup of the cameras' configuration.
2. The camera shall support the use of SNMP-based management tools according to SNMP v1, 2c & 3 / MIB-II.
3. The camera shall allow updates of the software (firmware) over the network, using FTP or HTTP.
4. The camera shall provide the ability to apply a rectangle of customer-defined number of pixels to the image, which can be used as a pixel counter identifying the size of objects in number of pixels.
5. The camera shall store all customer-specific settings in a non-volatile memory that shall not be lost during power cuts or soft reset.

p. Access log

1. The camera shall provide a log file, containing information about the 250 latest connections and access attempts since the unit's latest restart. The file shall include information about the connecting IP addresses and the time of connecting.
2. Provide a connection list of all currently connected viewers. The file shall include information about connecting IP address, time of connecting and the type of stream accessed.

q. Camera diagnostics

1. The camera shall be equipped with LEDs, capable of providing visible status information. LEDs shall indicate the camera's operational status and provide information about power, communication with receiver, the network status and the camera status.
2. The camera shall be monitored by a Watchdog functionality, which shall automatically re-initiate processes or restart the unit if a malfunction is detected.
3. The camera shall send a notification when the unit has re-booted and all services are initialized.

r. Hardware interfaces

1. Network interface
   a. The camera shall be equipped with one 100BASE-TX Fast Ethernet-port, using a standard male RJ45 connector and shall support auto negotiation of network speed (100 MBit/s and 10 MBit/s) and transfer mode (full and half duplex).

2. Inputs/Outputs
    a. The camera shall be equipped with one digital (alarm) input and one digital output, accessible via a removable terminal block. This input shall be configurable to respond to normally open (NO) or normally closed (NC) dry contacts.

s. Enclosure
1. The camera shall be manufactured with an IP66 and NEMA250 4X-rated polyester polycarbonate blend enclosure.
2. The camera shall be fitted with an adjustable weather shield.

t. Power
1. Power over Ethernet IEEE 802.3af/802.3at Type 1 Class 3

u. Environmental
1. Operate in a temperature range of -30 °C to +50 °C (-22 °F to +122 °F).
2. Operate in a humidity range of 10–100% RH (condensing).

D. Fixed dome 5 MP network camera

1. The fixed network camera shall meet or exceed the following design specifications:
    a. The camera shall operate on an open source; Linux-based platform, and including a built-in web server.
    b. The camera shall be equipped with an IR-sensitive progressive scan megapixel sensor.
    c. The camera shall provide a removable IR-cut filter, providing day/night functionality.
    d. The camera shall be manufactured with an IP66- and NEMA 4X-rated, IK10 impact-resistant aluminum casing.
    e. The camera shall provide the following camera angle adjustment:
        1. Pan ± 180°
        2. Tilt 18° - 75°
    f. The camera shall be equipped with three sensors and provide a 180° panoramic view.
    g. The lenses shall be factory-focused in order to eliminate the need for manual focusing.
2. The fixed dome network camera shall meet or exceed the following performance specifications:
    a. Illumination
        1. The camera shall meet or exceed the following illumination specifications:
            a. 0.3 lux in color
            b. 0.06 lux in B/W
    b. Resolution
        1. The camera shall be designed to provide 3x video streams in resolutions up to 2560x1440 at up to 30 frames per second (60Hz mode) or 25 frames per second (50Hz mode) using H.264 or Motion JPEG.
        2. The camera shall be designed to provide video streams in resolutions up to 5 MP at up to 20 frames per second (60Hz mode) or 16 frames per second (50Hz mode) using H.264 or Motion JPEG.
        3. The camera shall be designed to provide 3x Quad HD in resolution 2560x1440.
        4. The camera shall support video resolutions including:
            a. 2560x1440
            b. 1920x1080 (HDTV 1080p)
            c. 1280x720 (HDTV 720p)
    c. Encoding
        1. The camera shall support the following video encoding algorithms:

a. Motion JPEG encoding in a selectable range from 1 up to 25/30 frames per second in all resolutions.
b. Baseline Profile H.264 encoding with motion estimation in up to 25/30 frames per second.
c. Main Profile H.264 encoding with motion estimation and context-adaptive binary arithmetic coding (CABAC) in up to 25/30 frames per second.
d. Support High Profile H.264 encoding with motion estimation up to 25/30 frames per second.
e. Support H.264 with automatic scene adaptive bitrate control in up to 25/30 frames per second.

2. The camera shall provide independently configured simultaneous H.264 and Motion JPEG streams.
3. The camera shall in H.264 support Variable Bit Rate (VBR) for video quality adapted to scene content. To protect the network from unexpected bit rate speaks the camera shall support Constant Bit Rate (CBR) or Maximum Bit Rate (MBR).
4. The camera shall provide configurable compression levels.
5. Support standard baseline profile H.264 with motion estimation.
6. Support motion estimation in H.264/MPEG-4 Part 10/AVC.
7. The camera shall for its H.264 implementation support scene adaptive bitrate control with automatic dynamic ROI to reduce bitrate in unprioritized regions in order to lowering bandwidth and storage requirements.

d. Transmission

1. The camera shall allow for video to be transported over:
   a. HTTP (Unicast)
   b. HTTPS (Unicast)
   c. RTP (Unicast & Multicast)
   d. RTP over RTSP (Unicast)
   e. RTP over RTSP over HTTP (Unicast)
2. The camera shall support Quality of Service (QoS) to be able to prioritize traffic.

e. Image

1. The camera shall incorporate Automatic and Manual White Balance.
2. The camera shall incorporate an electronic shutter operating in the range of 1/71500 s to 1 s.
3. The camera shall incorporate Wide Dynamic Range - Forensic Capture functionality providing up to110dB dynamic range.
4. The camera shall incorporate capture alignment functionality.
5. The camera shall support manually defined values for:
   a. Color level
   b. Brightness
   c. Sharpness
   d. Contrast

f. User Interface

1. Web server
   a. The camera shall contain a built-in web server making video and configuration available to multiple clients in a standard operating system and browser environment using HTTP, without the need for additional software.

b. Optional components downloaded from the camera for specific tasks, e.g. Active X, shall be signed by an organization providing digital trust services, such as Verisign, Inc.

2. Language Specification
   a. The camera shall provide a function for altering the language of the user interface, and shall include support for at least 10 different languages.
3. IP addresses
   a. The camera shall support both fixed IP addresses and dynamically assigned IP addresses provided by a Dynamic Host Control Protocol (DHCP) server.
   b. The camera shall allow for automatic detection of the camera based on UPnP and Bonjour when using a PC with an operating system supporting this feature.
   c. The camera shall provide support for both IPv4 and IPv6.

g. Event functionality
1. The camera shall be equipped with an integrated event functionality, which can be trigged by:
   a. Video Motion Detection
   b. Audio Detection
   c. Live Stream Accessed
   d. Day/Night Mode
   e. Camera tampering
   f. Manual Trigger/Virtual Inputs
   g. Embedded third party applications
   h. Edge storage disruption detection
2. Response to triggers shall include:
   a. Send notification, using HTTP, HTTPS, TCP, SNMP trap or email
   b. Send images, using FTP, HTTP, HTTPS, network share or email
   c. Send video clip, using FTP, HTTP, HTTPS, network share or email
   d. Send SNMP trap message
   e. Recording to network attached storage
   f. Day/Night Vision Mode
   g. Overlay Text
3. The camera shall provide memory for pre & post alarm recordings.

h. Edge storage
1. The camera shall support continuous and event controlled recording to:
   a. Network attached storage, located on the local network
2. The camera shall be able to detect and notify Edge storage disruptions.

i. Protocol
1. The camera shall incorporate support for at least IPv4/v6, HTTP, HTTPS, SSL/TLS, QoS Layer 3 DiffServ, TCP, ICMP, SNMPv1/v2c/v3 (MIB-II), RTSP, RTP, UDP, IGMP, RTCP, SMTP, FTP, DHCP, UPnP, ARP, DNS, DynDNS, SOCKS, SSH, NTP, CIFS/SMB, Bonjour.
2. The SMTP implementation shall include support for SMTP authentication.

j. Text overlay
1. The camera shall:
   a. Provide embedded on-screen text with support for date & time, and a customer-specific text, camera name, of at least 45 ASCII characters.

b. Provide the ability to apply privacy masks to the image.

c. Allow for the overlay of a graphical image, such as a logotype, into the image.

k. Security

1. The camera shall support the use of HTTPS and SSL/TLS, providing the ability to upload signed certificates to encrypt and secure authentication and communication of both administration data and video streams.
2. The camera shall provide centralized certificate management, with both pre-installed CA certificates and the ability to upload additional CA certificates. The certificates shall be signed by an organization providing digital trust services.
3. The camera shall support IEEE 802.1X authentication.
4. The camera shall provide support for restricting access to pre-defined IP addresses only, so-called IP address filtering.
5. The camera shall restrict access to the built-in web server by usernames and passwords at three different levels.

l. API support

1. The camera shall be fully supported by an open and published API (Application Programmers Interface), which shall provide necessary information for integration of functionality into third party applications.
2. The camera shall support relevant ONVIF profiles as defined by the ONVIF Organization.

m. Embedded applications

1. The camera shall provide a platform allowing the upload of third party applications into the camera.

n. Installation and maintenance

1. The camera shall be supplied with Windows-based management software which allows the assignment of IP addresses, upgrade of firmware and backup of the cameras' configuration.
2. The camera shall support the use of SNMP-based management tools according to SNMP v1, 2c & 3 / MIB-II.
3. The camera shall allow updates of the software (firmware) over the network, using FTP or HTTP.
4. The camera shall provide the ability to apply a rectangle of customer-defined number of pixels to the image, which can be used as a pixel counter identifying the size of objects in number of pixels.
5. The camera shall accept external time synchronization from an NTP (Network Time Protocol) server.
6. The camera shall store all customer-specific settings in a non-volatile memory that shall not be lost during power cuts or soft reset.

o. Access log

1. The camera shall provide a log file, containing information about the 250 latest connections and access attempts since the unit's latest restart. The file shall include information about the connecting IP addresses and the time of connecting.
2. Provide a connection list of all currently connected viewers. The file shall include information about connecting IP address, time of connecting and the type of stream accessed.

p. Camera diagnostics

1. The camera shall be equipped with LEDs, capable of providing visible status information. LEDs shall indicate the camera's operational status and provide information about power, communication with receiver, the network status and the camera status.

2. The camera shall be monitored by a Watchdog functionality, which shall automatically re-initiate processes or restart the unit if a malfunction is detected.
3. The camera shall send a notification when the unit has re-booted and all services are initialized.

q. Hardware interfaces
1. Network interface
a. The camera shall be equipped with one 10BASE-T/100BASE-TX/1000BASE-T Fast Ethernet-port, using a standard male RJ45 connector and shall support auto negotiation of network speed and transfer mode (full and half duplex).

r. Enclosure
1. The camera shall:
a. Be manufactured with an IP66- and NEMA 4X-rated, IK10 impact-resistant aluminum casing providing encapsulated electronics.
b. Be fitted with a dehumidifying membrane.
c. Be fitted with a weather shield.

s. Power
1. Power over Ethernet IEEE 802.3at Type 2 Class 4
a. Max: 25.5 W
b. Typical: 18.3 W

t. Environmental
1. Operate in a temperature range of -40 °C to +55 °C (-40 °F to 131 °F).
2. Operate in a humidity range of 10–100% RH (condensing).

PART 3 EXECUTION

3.01 INSTALLATION

A. The Contractors or subcontractors main resources within the project shall carry proper professional certification issued by the manufacturer and verified by a third party organization to confirm sufficient product and technology knowledge.

B. The Contractor shall carefully follow instructions in documentation provided by the manufacturer to ensure all steps have been taken to provide a reliable, easy-to-operate system.

C. All equipment shall be tested and configured in accordance with instructions provided by the manufacturer prior to installation.

D. All firmware found in products shall be the latest and most up-to-date provided by the manufacturer, or of a version as specified by the provider of the Video Management Application (VMA) or Network Video Recorder (NVR).

E. All equipment requiring users to log on using a password shall be configured with user/site-specific password/passwords. No system/product default passwords shall be allowed.

F. A proper installation shall meet NEC (National Electrical Code – US only) per the guidelines of that year’s revision. When properly installed equipment meets Low Voltage, Class 2 classification of the NEC.

END OF SECTION